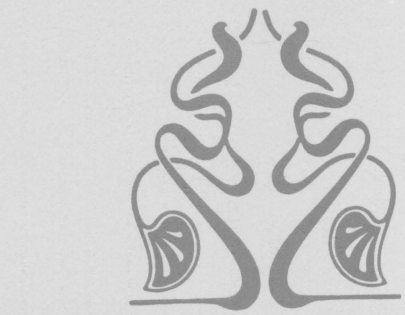
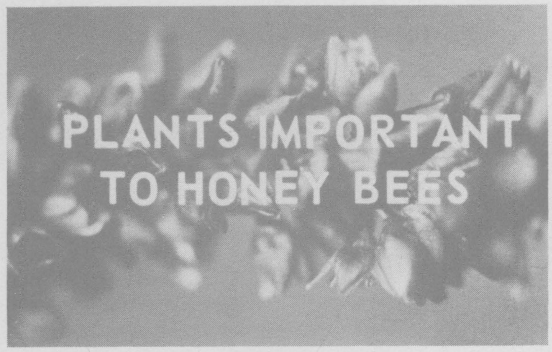
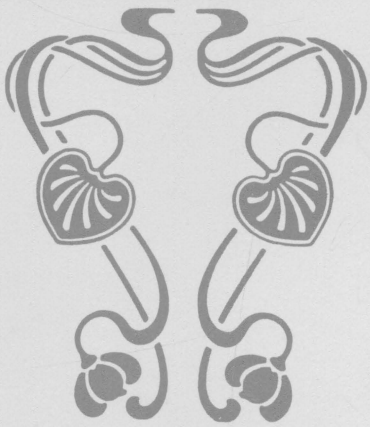






Cooperative Extension Service
The Ohio State University

PLANTS IMPORTANT TO HONEYBEES

Lawrence J. Connor, Ph.D.
Extension Entomologist

Honeybees and flowers have a unique relationship, for neither could survive without the other. The study of this relationship is called BEE BOTANY. To a beekeeper, this involves the flowering plants that provide food for honeybees and help them survive.

Fig. 1

Some of the many plants important to honeybees are shown in this publication. You should be able to look at a field of flowers (Fig. 1), and be able to tell which plants are attractive to honeybees and those that are not.

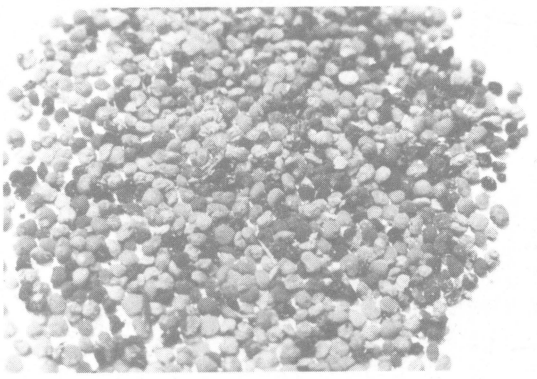


Fig. 2

Honeybees visit flowers to collect two materials, pollen and nectar. Pollen, which is shown (Fig. 2) as pollen pellets, is extremely valuable to bees because it is the only natural source of protein bees have. These pollen pellets are collected on the hind legs of honeybees. Without this pollen, colonies would be unable to produce new bees and would eventually die.

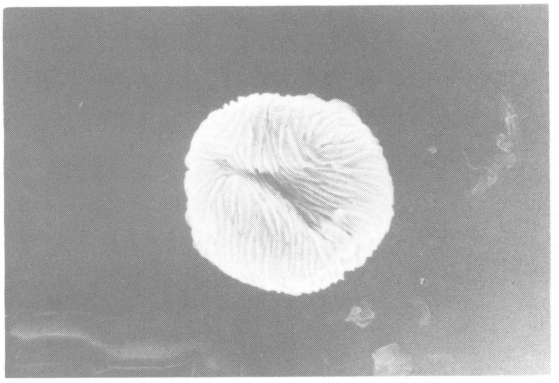


Fig. 3

A single pollen grain, (Fig. 3) from a strawberry flower, was isolated and viewed through a scanning electron microscope. Each plant species produces a different shape of pollen grain, and plants may be identified by using differences in pollen shapes. It takes many thousands of pollen grains such as this to make up a single pollen pellet.

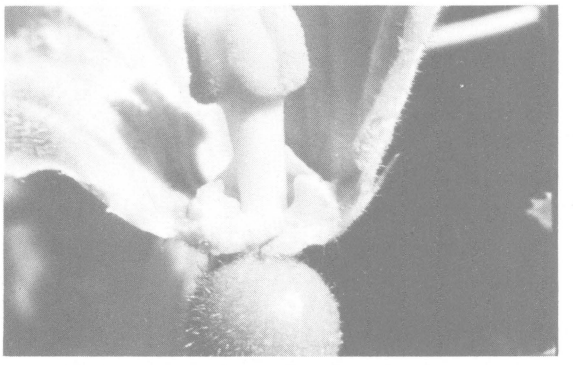


Fig. 4

Nectar is the other food gathered by bees, and is the raw material of honey (Fig. 4). Bees convert the complex sucrose contained in nectar, into the simple sugars, dextrose and levulose, And at the same time, bees reduce the moisture content of nectar to less than 20%. Honey is the energy food which allows bees to carry on their activities.

Fig. 5

In addition to pollen and nectar, honeybees also need water for their survival (Fig. 5). Water is used to dilute honey, help raise new bees, and to cool the hive during warm weather. When bees are forced to fly a great distance to gather water, many are diverted from honey production or pollination. So beekeepers often help their bees by placing a clean water source in the bee yard.

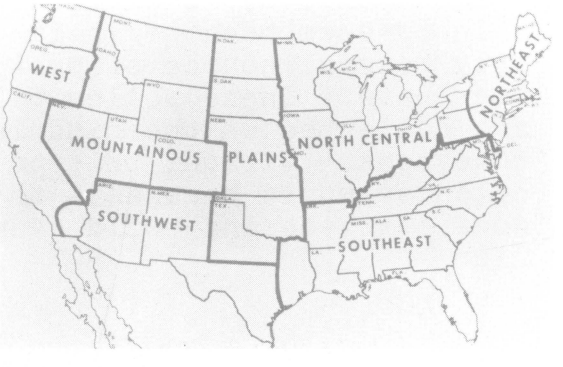


Fig. 6

I have selected photographs of plants which are commonly found in several of the major U.S. beekeeping regions. The map shows what these regions are. (Fig. 6).

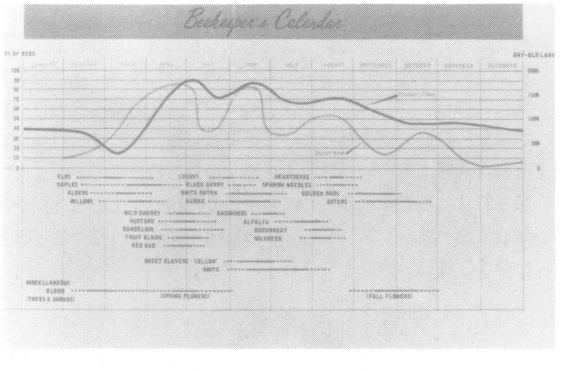


Fig. 7

I found it useful to classify flowers by the approximate time they start to bloom (Fig. 7). Of course, these times vary in different parts of the country. But the general patterns which I will show will help you recognize and appreciate the different flowering groups.

EARLY SPRING FLOWERS

In the early spring, colonies are often very low or out of stored food, making the first flowers of the season extremely important.

Fig. 8

Willow trees, and shrubs, produce yellow catkins in the early spring, with separate plants having either male or female flowers (Fig. 8). Mature trees may reach heights of 100 feet and so, produce a large amount of pollen and nectar.

Fig. 9

Likewise, several species of maple trees bloom very early (Fig. 9). Red maple opens its flowers on the first warm days in February or March in the Central States Regions. Sugar maple, blooms later and sometimes produces a surplus of honey. But early honey crops are usually converted by the bees into more bees.

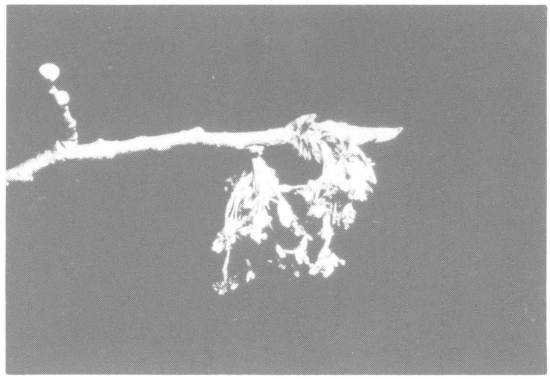


Fig. 10

The American elm and other elm species produce pollen in the early spring when the weather warms (Fig. 10). Elms are wind pollinated plants, and produce no nectar. But bees find the pollen extremely attractive and gather it actively.

Fig. 11

Another group of trees are the large, tall, cottonwood trees, which provide a very rich source of pollen during the spring (Fig. 11). Again, honeybees use this pollen to produce new bees.

These male cottonwood flowers produce the pollen (Fig. 12). The pistillate flowers must have pollen placed on them, by bees or by wind, in order to develop seeds.

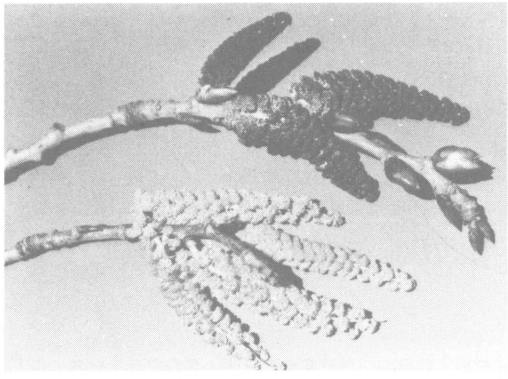


Fig. 12

On the floor of local woodlots, Spring Beauty and other flowers are very common and are attractive to bees for food (Fig. 13). But unfortunately, their acreage is usually limited.

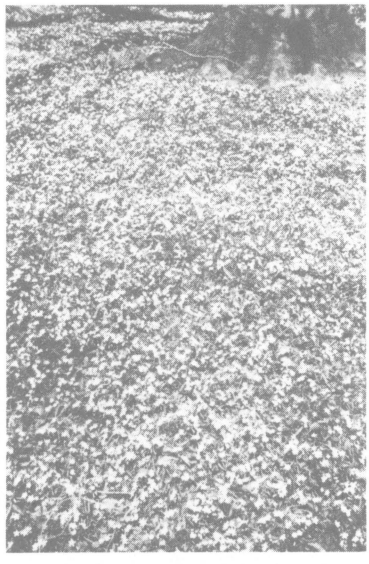


Fig. 13

MAIN SPRING FLOW

Now we come to the height of spring, and to many of us, spring just would not be complete without the common dandelion. To bee colonies, dandelion fields are often the first major source of nectar and pollen they find in the spring. This is particularly true if the earlier weather has been bad.

Fig. 14

Nearly all dandelion honey is immediately converted into more bees (Fig. 14). The pollen pellets on the hind legs of this bee are important for production of worker bees.

Fig. 15

Backyard beekeepers benefit from lawns such as this (Fig. 15). However, increased use of herbicides has reduced the abundance of dandelion and other plants from lawn areas. Dandelion and Dutch white clover are now lost from many suburban and urban settings where herbicides are extensively employed.

Fig. 16

Both wild and commercial fruit trees also provide a major source of pollen and nectar in the spring (Fig. 16). Apple, pear, plum, peach and cherry produce pollen and nectar. Beekeepers seek commercial fruit orchards for pollen and nectar, and growers seek bees for essential pollination.

Fig. 17

Both wild trees and cultivated trees of a species are attractive. For example, both sour cherry, wild cherry and choke cherry are good suppliers of pollen and nectar, as well as domesticated cherries (Fig. 17).

Fig. 18

Figure 18 idealy typifies the close relationship which has developed between bees and flowers through the process of co-evoluation. Apple flowers must be visited by a pollen-carrying insect, such as a honeybee, to set fruit. And in order to attract insects, the flowers must provide pollen and nectar to reward the insect for visiting it. In the process, both the plant and the insect have benefited.

Fig. 19

In the southern and western states citrus trees are a major source of pollen and nectar (Fig. 19). Bees are brought from the northern states to benefit from the citrus flowers. As a result, migratory beekeeping is a major aspect of commercial honey production.

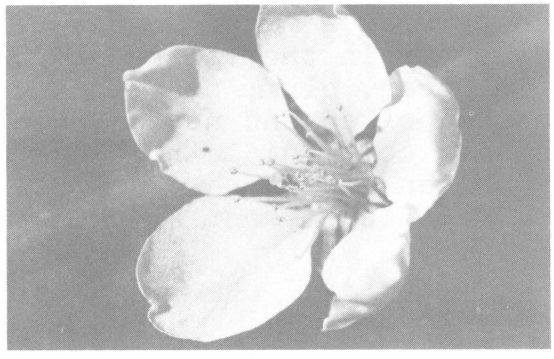


Fig. 20

In peaches, different varieties vary in their need for insect visits (Fig. 20). But bees usually increase yields for commercial growers. Certain varieties are more or less self-fertile. The nectar and pollen from peaches also helps the bees build in strength.

Fig. 21

Pear flowers are among the most unattractive to honeybees (Fig. 21). This means there is a problem in obtaining complete pollination of the crop. Growers usually wait until the last minute to move bees in, so bees provide some pollination before they search the area and find something more attractive to visit.

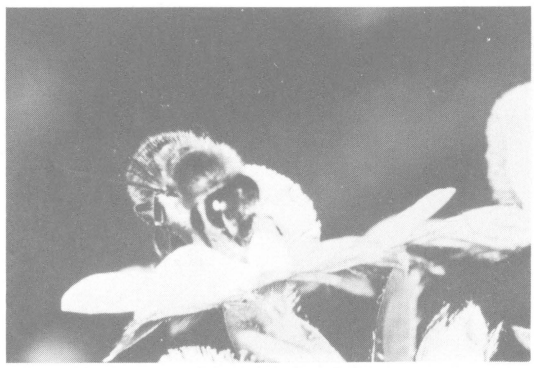


Fig. 22

Along with the fruit trees, various berries provide important pollen and nectar (Fig. 22). Many forest and meadow areas are loaded with strawberry flowers, and commercial fields are usually very attractive to bees. When the acreage is large, a surplus crop of honey might result.

Fig. 23

The highbush blueberries are also worked by bees, but different varieties are quite unattractive, like pear flowers (Fig. 23). Blueberries were once thought to be self-fertile, but research has shown that honeybees greatly increase berry crops. Now growers rent an average of 2 colonies per acre for blueberry pollination.

Fig. 24

The large plant group called the mustards, along with common yellow rocket or wintercress, are often considered weeds in vacant fields (Fig. 24). But they represent an extremely attractive group of plants to honeybees. Usually following dandelion and fruit bloom, yellow rocket often produces a modest surplus crop for the beekeeper to harvest.

Fig. 25

In Europe and parts of Canada, field mustard or rape is grown as an oil-seed plant (Fig. 25). Beekeepers obtain some honey from the plants, and the farmers like the bees for pollination. This is one of the black bees of Europe--where blooming rape fields scatter the countryside in spring.

Fig. 26

Also blooming at this time is the tulip poplar, or yellow poplar (Fig. 26). The flowers are large and greenish-yellow in color and the leaves are nearly square.

Figure 27 shows a worker honeybee gathering nectar from an extra-floral nectary located outside the flower. Such flowers produce a dark red honey from Maryland and Delaware to Georgia and Alabama.

Fig. 27

EARLY SUMMER FLOWERS

It is difficult to divide some of the plants into different groups, but as spring becomes summer, the number of plant species contributing to the welfare and productivity of bee colonies, increases rapidly.

Fig. 28

Black locust is often sought by beekeepers for its white honey (Fig. 28). Unfortunately, due to weather problems, the trees fail to produce large crops in many areas, and locust honey is often hard to find.

Fig. 29

The brambles, including the blackberry and the raspberries, represent a common and diverse group of plants which produce a light to amber honey (Fig. 29). Combined with the stimulation from yellow rocket, the brambles provide colonies with good preparation for the major summer flows soon to follow. Raspberry is often considered a major honey crop in the northeastern United States, and is also a good source of pollen.

Fig. 30

The vetches are legumes (Fig. 30). This common hairy vetch has purple flowers and was once promoted as a forage crop, but a seed insect interfered with good production. When present in large acreages, vetch produces a mild, water-white honey considered ideal for blending by commercial honey packers.

Fig. 31

Another vetch, crown vetch, should not be confused with hairy vetch (Fig. 31). Crown vetch is used for soil banks, roadside erosion control and in reclaimed stripmined areas. But for some reason, it is a very poor nectar producer, and crown vetch cannot be considered a nectar or pollen source for bees.

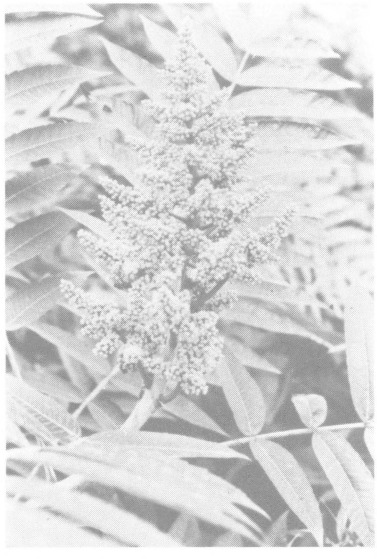


Fig. 32

Sumac is a shrub which grows to 20 feet in height (Fig. 32). It has compound leaves and fuzzy stems. It blooms in late spring or early summer, and sometimes provides a honey surplus.

Clovers were once considered the most important source of nectar for honeybees in North America. But the vastly changed agricultural production system has affected this, and the acreage of certain clovers is now rapidly dwindling.

Fig. 33

White or Dutch white clover is a leading honey producer in some parts of the United States, but is threatened by herbicides as we mentioned earlier (Fig. 33). Growing along the ground, white clover leaves have and arrow shaped mark on them.

Fig. 34

Alsike clover lacks this leaf marking, and has branched stems as well (Fig. 34). In established areas, it produces a white to light-amber honey. Crimson clover is a good nectar source in the south.

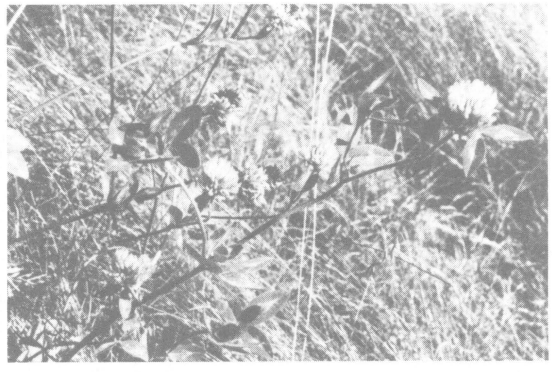


Fig. 35

There is general disagreement as to how much nectar bees obtain from red clover (Fig. 35). Usually, under dry conditions, bees will be able to collect enough nectar to produce a light amber honey. In addition, pollen is usually abundant.

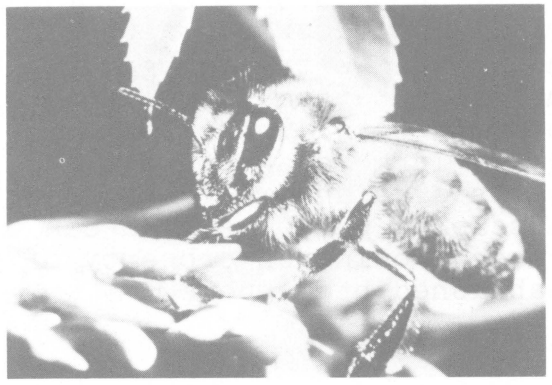


Fig. 36

My favorite clovers are the white and yellow sweet clover (Fig. 36). Yellow sweet clover blooms over an extended period during the summer. The exact period of bloom is determined by the amount of rainfall and the temperature.

Fig. 37

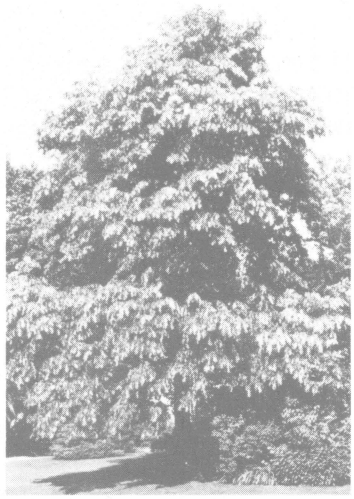
About ten days after yellow sweet clover starts to bloom, white sweet clover appears (Fig. 37). Yields from the two sweet clovers are often very good, and they are generally considered the best honey plants found in the U.S. They also supply abundant pollen.

Fig. 38

In the United States, alfalfa is a good nectar producer-- usually in the later cuttings (Fig. 38). Unfortunately, growers try to cut the plants before they bloom, deminishing alfalfa's role in nectar production.

Fig. 39

An attractive, colorful flower, birdfoot trefoil can be grown in some areas where other legumes are less successful (Fig. 39). While it is not as good a producer, it can be productive in large stands.



We can conclude this early summer period with basswood, also called linden or lime tree (Fig. 40). The clusters of cream-colored flowers produce a water white honey, often in very large quantities. Basswood is also an excellent tree for landscaping purposes, and can often be seen growing on property of many established beekeepers.

Fig. 40

SUMMER

When the season reaches its peak activity in summer, both the numbers of bees and the number of plants are also at their peak. Many flowers contribute to the summer nectar and pollen flow.

Milkweed is an herb common to neglected farmland and roadsides (Fig. Blooming from June through August, the pink flowers are attractive to honeybees, but sometimes bees become tangled in the waxy pollinia of the flowers. Other milkweed species are commonly visited by honeybees.

Fig. 41

The thistles are all common weeds, but are a great benefit to honeybees and wild bees (Fig. 42). A favorite of bumblebees, they often have a prolonged flowering period when the rainfall is adequate.

Fig. 42

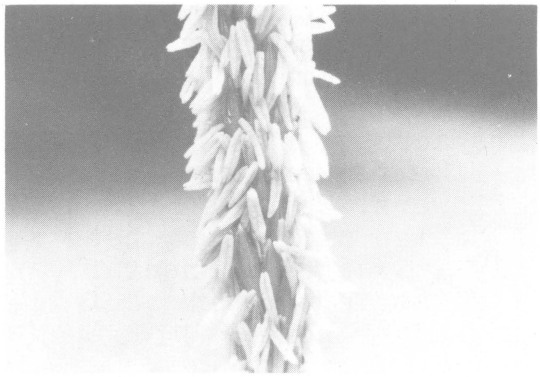


Fig. 43

The corn plant-- producer of many of the sirups which compete with honey on the grocer's shelf--produces abundant pollen for bees, but no nectar (Fig. 43). When bees are actively gathering the pollen in commercial fields of corn, pesticide applications must be avoided.

Fig. 44

Minor plants sometimes are very important to bees on a local basis. For example, Queen Anne's Lace, or wild carrot, is attractive to many insects, such as this soldier beetle, and it is not always attractive to honeybees (Fig. 44). But when a shortage of other pollen plants occurs, bees will forage on these flowers.

Fig. 45

Also, the touch-me-nots are minor plants, but can be commonly found along rivers, lakes and streams. (Fig. 45). It will attract bumblebees, honeybees and many wasps for the nectar from the attractive flowers. This honeybee is gathering nectar from a hole cut by a bumblebee at the spur-end of the flower.

Fig. 46

Mints are a large and diverse group of plants, and certain species produce marvelous honey crops (Fig. 46). Mints are found in many different types of areas, and often suppliment the nectar and pollen production from early spring to fall.

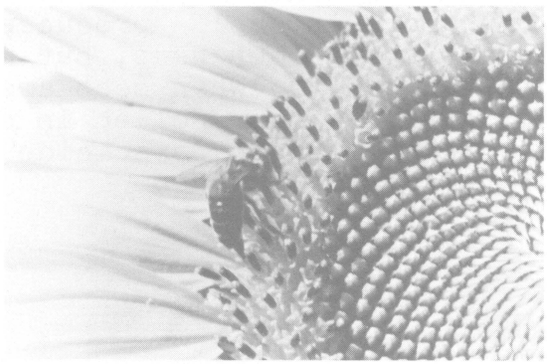


Fig. 47

The domestic and wild sunflowers are large herbs important for good for birds and man. The large composite heads are sometimes several inches across, with yellow-brown disc-like flowers and large yellow ray flowers. While sunflowers are good pollen producers, bees seem mainly attracted to nectar, which will be converted into a full-flavored yellow-amber honey. (Fig. 47).

Fig. 48

Most of us recognize the soybean as a major agricultural crop, grown for both food and oil (Fig. 48). It also may produce a honey crop when the variety, the weather, and the bees all work together. The potential hybridization of soybeans may mean that millions of colonies of honeybees will be required for pollination.

Fig. 49

It is surprising to many people to learn that cotton is an important nectar-producing plant (Fig. 49). Where cotton is grown, it is often <u>too</u> attractive to the bees, for the bees are killed by insecticide applications.

Fig. 50

Vine crops are grown throughout the country, and all depend upon bees for adequate pollination. Cucumbers, pumpkins (fig. 50), melons, squash, and other vine crops produce both male and female flowers, and bees must transfer the pollen. This male flower is a good supplier of nectar, but produces very little pollen. Female flowers, of course, produce only nectar.

Fig. 51

Unfortunately, there are usually so few flowers in a field of vines such as this, that the potential nectar production is very small compared to other competitive nectar sources (Fig. 51).

Fig. 52

A large group of plants called smartweed, heartsease, or knotweed, are often pesky weeds in farmers' fields--particularly in soybeans where herbicides have failed to work (Fig. 52). Also found in waste areas and wet spots, many beekeepers who once produced large clover crops now get their large honey crop from these weeds in major agricultural areas.

Fig. 53

Smartweed and its relatives produce a white to light amber honey, which is full-flavored and often is blended with other honeys and used for bakery honey. (Fig. 53).

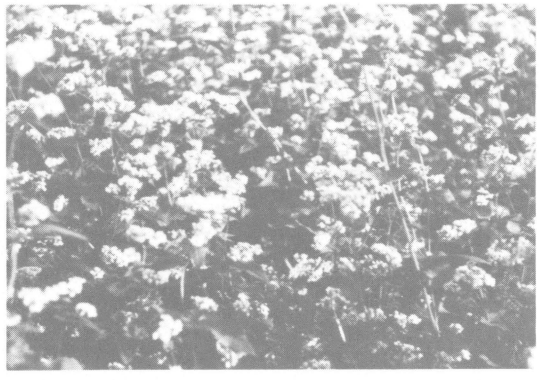


Fig. 54

Buckwheat is a relative of smartweed, and is appearing in increasing acreages in some eastern states (Fig. 54). It also produces a full-flavored honey, and it is quite dark in color.

Fig. 55

The plant group called Bidens by botanists, represents a large and complex group of good nectar and pollen producers. These include Spanish needle, bur-marigold, and beggar ticks. Some species, as these bur-marigolds, have conspicuous ray flowers (Fig. 55).

Fig. 56

These beggar-tick flowers, however, do not have any ray flowers-- but still attract the honeybees (Fig. 56).

Fig. 57

A bristly weed, 1 to 2 1/2 feet tall, is Viper's Bugloss or Blueweed and is found in waste places and along roadsides from June to September (Fig. 57). It produces a water-white honey with a good flavor.

Fig. 58

There are several species of vervain, which range from southern Canada to Florida and Arizona (Fig. 58). The angled stems carry blue flowers with tubular corollas. A white honey is produced, and is considered a important honey plant in several areas.

Fig. 59

Spotted knapweed is a relative of the garden bachelor's button and is also called star thistle, which confuses it with a California species (Fig. 59). Spotted knapweed is commonly found in waste fields in the Great Lakes area, where it produces large amounts of pollen and nectar. The resulting light honey is high in levulose sugar, making it slow to granulate.

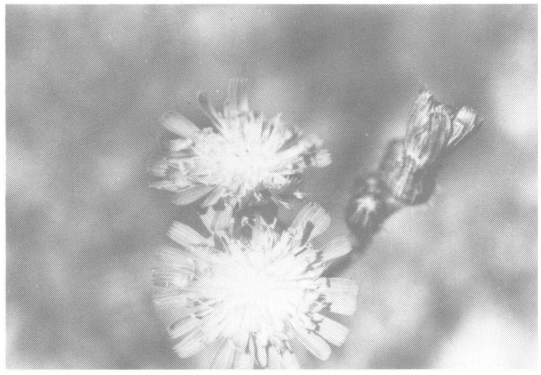


Fig. 60

Sometimes in mowed areas, hawkweed or devil's paintbrush continues to bloom long after they normally would have stopped for the season (Fig. 60). This extends its usefulness of this plant to the bees by several weeks.

FALL FLOWERS

The goldenrods and asters are the most common fall flowers. But there are other plants which bloom in the fall, and we should discuss them, because they provide the honey and pollen the bees must over-winter upon.

Fig. 61

Ironweed is a major nectar producer in the eastern United States (Fig. 61). It helps become part of the honey which beekeepers label "Fall Flowers".

Fig. 62

Thoroughtwort and boneset are coarse herbs about 2 feet tall (Fig. 62). They bloom in late summer or early fall, and may produce a surplus on their own.

Fig. 63

But the goldenrods can produce a very large surplus-- when the species are right (Fig. 63). Not all species are good nectar and pollen producers, and you should scout in the neighboring fields to check which species the bees are actually working. I personally have seen large acreages of the plume-like goldenrod-- but with few bees.

Fig. 64

Honeybees are generally attracted to many of the "flat-topped" species of goldenrod (Fig. 64). If you smell the flowers, you will notice that they have the same odor that the beeyard will have when bees are working goldenrod. This odor quickly fades.

Fig. 65

The bee here has only a trace of pollen on the corbicula-- the pollen basket on her hind leg-- an indication that she is gathering only nectar (Fig. 65). When you look at all the florets on these goldenrod flowers, you can realize why there may be 1 million on just one plant, and why bees find goldenrod so attractive.

Fig. 66

Goldenrod, aster, boneset, ironweed and even dandelion all contribute to fall honey. The asters are also very important pollen producers-- giving the bees, like this native bee, more pollen than any other group of plants blooming all season (Fig. 66). Asters are difficult to identify correctly.

Fig. 67

Pollen gathering by bees on aster is usually quite conspicuous, and I suggest you look and see how much yellow pollen the bees have as they fly into their hives. (Fig. 67).

Fig. 68

This is the Bushy Aster. These flowers will bloom until the last of the season--often after several "killing" freezes (Fig. 68).

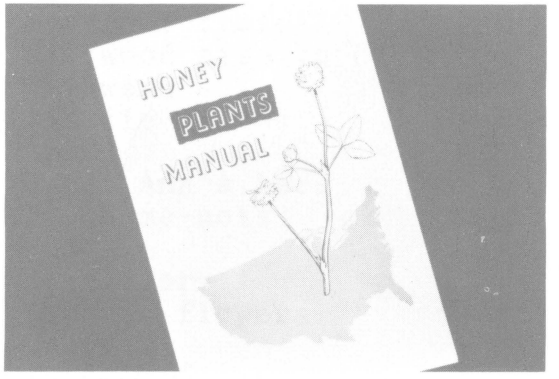


Fig. 69

We have consulted several references on the subject of Bee Botany which you might want to consult. The first if "Honey Plants Manual" by Harvey B. Lovell, published by the A. I. Root Company of Medina, Ohio.

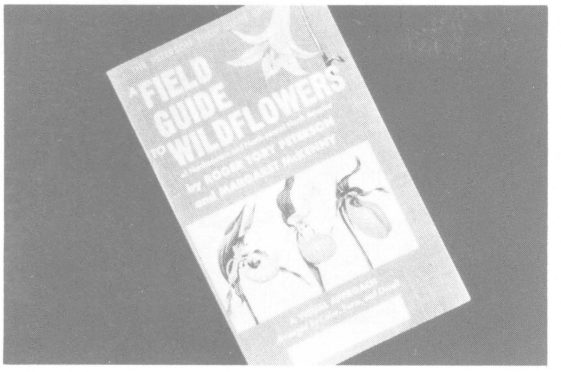


Fig. 70

The second is "A Field Guide to Wildflowers" by Peterson and McKenny, and published by Houghton Mifflin Company, Boston.

ACKNOWLEDGEMENTS

This was written with the help of Dr. Dewey Caron, Extension Specialist in Apiculture at the University of Maryland and by Mr. Lawrence Goltz, Managing Editor of Gleanings in Bee Culture.

The author would like to express his sincere appreciation to the many photographers who contributed certain photos: Larry Goltz, Dewey Caron, W. A. Stephen, Seymour Bailey, Charles Divelbiss, Thomas Rinderer, Quint Bunch, and U.S.D.A.

SUMMARY OF PHOTOS

Number	Photo Title	Latin name
1.	Mixed field of early fall flowers	Milkweed, goldenrod, & others
2.	Pollen pellets	Source unidentified
3.	Strawberry pollen grain	Fragaria spp.
4.	Nectar in cucurbit flower	Cucurbita spp.
5.	Bees at water puddle	
6.	Map of beekeeping regions of U.S.	Source: U.S.D.A.
7.	Beekeeper's Calendar	Source: Ohio State University
8.	Willow	Salix spp.
9.	Early maple with bee	Acer rubrum
10.	Elm flowers	Ulmus spp.
11.	Cottonwood tree	Populus spp.
12.	Male Cottonwood flowers	Populus spp.
13.	Spring beauty	Claytonia virginica
14.	Bee on Dadelion	Taraxacum officinale
15.	Lawn with dandelion	Taraxacum officinale
16.	Honeybee on apple	Pyrus malus
17.	Cherry	Prunus spp.
18.	Bee on apple flower	Pyrus spp.
19.	Citrus with colonies	Citrus spp.
20.	Peach Flower	Amygdalus persica
21.	Pear flowers	Pyrus communis
22.	Strawberry field	Fragaria spp.
23.	Blueberry bush	Vaccinium spp.
24.	Mustard plants	Brassica spp. Yellow Rocket (Barbarea vulgaris
25.	Honeybee on rape	Brassica napus
26.	Tulip poplar	Lirodendron tulipifera
27.	Tulip poplar, bee at extra-floral nectary	Lirodendron tulipifera
28.	Black locust	Robina pseudoacacia
29.	Blackberry	Rubus spp.
30.	Hairy Vetch	Vicia villosa
31.	Crown vetch	Coronilla varia
32.	Sumac	Rhus spp.
33.	White Dutch clover	Trifolium repans
34.	Alsike clover	T. incarnatum
35.	Red clover	T. pratense
36.	Yellow sweet clover	Melilotus officinalis
37.	White sweet clover	M. alba
38.	Alfalfa	Medicago sativa
39.	Birdfoot trefoil	Lotus corniculatus
40.	Basswood tree in bloom	Tilia americana
41.	Milkweed	Asclepias syriaca
42.	Thistle	Cirsium spp.
43.	Corn	Zea mays
44.	Queen Ann's Lace	Daucus carota
45.	Touch-me-nots	Impatiens capensis
46.	Mints	Several genera
47.	Sunflowers	Helianthus spp.
48.	Soybean flowers	Glycine max
49.	Cotton	Gossypium hirsutum
50.	Pumpkin flower	Cucurbita spp.
51.	Pumpkin field	Cucurbita spp.
52.	Smartweed	Polygonum spp.

Summary of Photos Continued

53.	Smartweed	Polygonum spp.
54.	Buckwheat	Fagopyrum escalentum
55.	Bur-marigold	Bidens spp.
56.	Beggar-ticks	Bidens spp.
57.	Viper's Bugloss	Echium vulgare
58.	Vervain	Verbena spp.
59.	Spotted knapweed	Centaurea maculosa
60.	Hawkweed	Hieracium spp.
61.	Ironweed	Veronia spp.
62.	Boneset	Eupatorium spp.
63.	Goldenrod, plume type	Solidago spp.
64.	Goldenrod, Flat-topped type	Solidago spp.
65.	Bee on flat-topped goldenrod	Solidago spp.
66.	Native bee on aster	Aster spp.
67.	Honeybee on aster with pollen pellets	Aster spp.
68.	Bushy aster	Aster spp.
69.	Honey plants Manual	
70.	A Field Guide to Wildflowers	

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Issued in furtherance of Cooperative Extension Work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Roy M. Kottman, Director of the Cooperative Extension Service, The Ohio State University.